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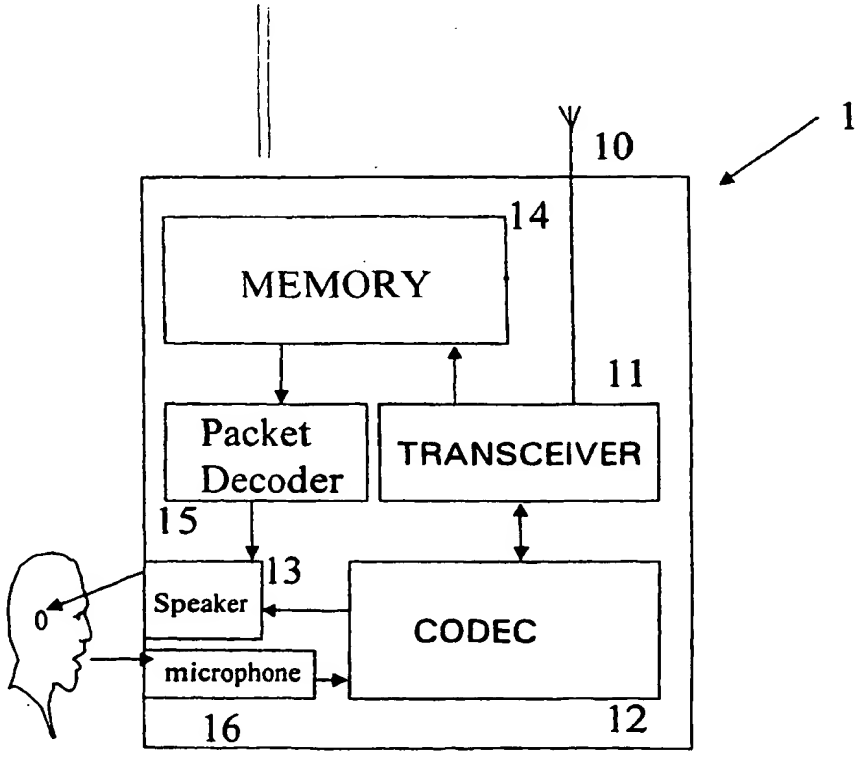
(54) Title: VOICE MESSAGING SYSTEM

(57) Abstract

Where real-time transmission is not required, for example in a voicebank application, a message can be sent more efficiently (requiring less bandwidth) using packetised data transmissions for re-assembly at the remote end. The voice messaging system of the invention comprises a voicemail system for receiving and storing audio messages in a telephone network, a packetiser for converting said audio messages into data packets, and a means of transmitting said data packets to a terminal during the progress of another call, either during silent periods or as an out-of-band signal. The terminal (1) has means for storing said data packets (14) and assembling them into (15) an audio message for subsequent playback. By transmitting the message in packet form, network capacity is used more effectively. The system can also be used for sending messages to a voicebank, using suitable equipment in the user equipment (1) to buffer the outgoing message.



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VOICE MESSAGING SYSTEM

This invention relates to voice messaging systems. In the described embodiment it is used in a cellular mobile radio network, but the system is also of application to a conventional fixed system.

A voice mail system is a system in which audio signals, generally in the form of speech can be stored for subsequent retrieval by a specified user of the network. In a typical application, the voice mail system is activated to store messages when the intended recipient is unable to take a call, for example because he is currently engaged on another call, or his telephone is not answered, or, in the case of a mobile telephone, the telephone is switched off or not currently in communication with its host network. The user can then retrieve any messages that have been stored, at a time convenient to him.

In this specification, the term "messaging system" includes systems in which the messages are stored by the telephone network (often referred to as "voice mail" systems) and also those in which the messages are stored in the customer equipment (the telephone or an accessory thereto), which are generally known as "answering machines".

Answering machines suffer from the problem that they can only receive messages when the telephone is connected to the network. This allows messages to be left only when the telephone is connected to the network but not otherwise in use. They are therefore unsuitable for use with mobile telephones, which are frequency switched off or not in communication with the network. Moreover, answering machines cannot receive messages when the telephone line is already in use.

Voice mail systems have the disadvantage that the user needs to connect to the network in order to retrieve the messages. If for any reason the user wishes to edit, or retrieve a message for a second time, this requires further connections to the network. Such calls can be expensive, and from the point of view of the network operator they use up value network capacity.

According to the present invention there is provided a voice messaging system comprising a voicemail means for receiving and storing audio messages in a telephone network, a packetiser for converting said audio messages into data packets, and transmitter means for transmitting said data packets to a

predetermined terminal, and a receiver in the predetermined terminal for receiving said data packets, a memory for storing said data packets, a decoder for assembling said data packets into an audio message, and player means for playing said audio message:

characterised in that the transmitter and receiver are operative to transmit and receive said packets over a speech channel whilst a call is in progress.

By converting the message into a series of data packets the audio message can be transmitted piecemeal, as channel capacity is available in the network. The message can then be stored in the terminal equipment ready for retrieval by the user on demand. As the data packets do not require a voice channel they may be transmittable in parallel with voice messages, if there is sufficient channel capacity. In particular, the data packets may be transmitted as out-of-band data signals in a voice channel currently in use. In a particularly preferred arrangement, they may be transmitted over the voice channel during "quiet" periods when no voice signal is being transmitted in that direction.

In the preferred embodiment the messages are stored in their data packet form, and assembled for generation into a conventional audio form as required by the user. However they may, if preferred, be stored in their assembled speech form.

The invention also relates, in further aspects, to telephone terminal equipment, and to a telephone network, having the features specified above.

An embodiment of the invention will now be described, by way of example only, with reference to the figures, in which:

Figure 1 shows in schematic form a telephone network according to the invention; and

Figure 2 shows in schematic form a telephone terminal equipment according to the invention.

In the described embodiment, the telephone system is a cellular radio network, but the system is equally applicable to fixed networks.

Figure 1 shows schematically the functional relationship between those components of the network necessary to the understanding of this invention. Figure 1 shows a mobile telephone 1, connected to the cellular radio network through a radio base transceiver site 2b which is one of several (see also 2a) connected to a base site controller 3. The base site controller 3 is in turn

connected to a mobile switching centre 4 which controls the routing of telephone calls to and from mobile telephones connected to the base transceiver sites 2a, 2b under its control. The mobile switching centre has a number of ancillary functions. In particular, there is a "visitor location register" 5 which stores details of the location within the mobile network (more specifically, the base transceiver site) of each mobile telephone 1 currently operating within its area of coverage. There is also a voice mail system 6 to which calls are routed when the appropriate mobile telephone 1 has calls diverted. This is controlled by a setting in the VLR 5.

A new element of the telephone system is a packetiser 7 which causes messages stored in the voice mail system to be converted into data packets for retransmission. Although as shown the packetising takes place on downloading of the voice mail messages to the user, it may be prefferred to generate the packets before storage in the voice mail system.

Figure 2 shows schematically the functional relationship between those components of the terminal equipment 1 necessary to the understanding of this invention. The terminal equipment 1 comprises a connection 10, 11 to the rest of the network. In this mobile telephone embodiment this connection comprises a radio antenna 10, connected to a transceiver 11 which extracts the information content from the radio carrier. In a fixed telephone the connection would comprise the conventional wired connection. In this embodiment the speech signals are carried in digital form and require conversion in a codec 12 before passing to a speaker 13 for converting to sound signals for the user to hear. The transceiver 11, is also configured to receive data signals, and in particular data packets, which are stored in a memory 14. When the user requires these signals to be retrieved, the signals can be retrieved from the memory 14, and assembled in a packet assembler 15 for conversion to a speech signal to be generated as a sound signal by the speaker 13.

Although not contributing to the operation of the invention, the terminal 1 is also fitted with the conventional microphone 16 for allowing speech signals to be transmitted from the user, by way of the codec 12 and transceiver 11, to the rest of the network through the interface 10.

Modern mobile telephones have the capability of handling other packetised data, for example in the GSM standards there is the so-called "short messaging system" SMS which transmits data for display on a visual display unit. The

transceiver 11 can distinguish the different forms of data and store them appropriately.

As previously indicated, the data packets may be decoded before or after storing the message in the memory 14. In the terminal equipment it is preferred to store them in packetised form because this reduces the memory capacity required. However, in the network memory 6 it may be preferable to store the voice mail in unpacketised form as there may be terminal equipment not suited to receiving messages in packetised form, in which case the messages can be retrieved in the conventional way.

The system operates as follows. When a message has been left in the voice mailbox 6 a flag is set in the VLR 5 in the record relating to the individual user terminal 1 to indicate that there is a message stored. (Analogous systems operate in a fixed network, where there is a user profile record in which a flag can be set in a similar manner). If this flag is set in the VLR 5, then whenever capacity is available for transmitting one or more data packets to the user terminal 1, the voice mail system 6 is prompted to convert messages stored therein into packets using the packetising unit 7. These packets include header data indicating that they form part of a voice message. These packets are then transmitted to the terminal 1 through the telephone network as and when capacity is available for such packets. This may be done using a free data channel, or it may be possible to provide the data packets as out-of-band signals on the same channel as a voice communication between the user and another party. In a normal conversation only one of the two parties to the call speaks at any given time. If a duplex channel is in use between the terminal and the rest of the network then, when the user of the terminal 1 is speaking there is free capacity in the reverse direction, which can be detected by the absence of speech in that direction, and packets may be transmitted during such periods. Transmission of packets can be suspended at any time since it is not necessary for the packets to be transmitted in real-time.

The packets are received at the transceiver 11 which recognises that they are data packets forming part of a voice message because of the header data provided by the packetiser 7, and stores all such packets in the memory 14. The user is then given an indication that there is a new message in the memory 14 and when he wishes to retrieve it the packets are assembled using the packet decoder 15 and converted to a audio signal in the speaker 13 for the user to hear.

Meassges stored in the memory 14 may be stored for listening to subsequently, or deleted, or other processes may be carried out on them in the memory 14 without the need to make further contact with the network. The data packets may also include other data, such as the time the message was left, the caller's line identity.

The message stored in the memory 14 can be compressed by the removal of certain parts of the data message received by the transceiver 11, which are only necessary for the accurate transmission of the data. Such compression can include the removal of error correction bits and other data overhead required for accurate transmission over the interface between the terminal 1 and the rest of the network.

The transceiver may carry out basic error checking functions, such as ensuring that all the necessary packets have arrived. Generally data packes include a sequence number to ensure that no packet is lost, in order to allow for the detection of the loss of a packet. The loss of a packet may not necessarily be important given the nature of the message, since minor errors in voice transmission can be accommodated by a listener. However the transceiver may nevertheless be arranged to return an error message to the network should an error be detected. This will allow the packet to be retransmitted.

CLAIMS

1. A voice messaging system comprising a voicemail means (6) for receiving and storing audio messages in a telephone network, a packetiser (7) for converting said audio messages into data packets, and transmitter means (2a, 2b) for transmitting said data packets to a predetermined terminal (1), and a receiver (11) in the predetermined terminal (1) for receiving said data packets, a memory (14) for storing said data packets, a decoder (15) for assembling said data packets into an audio message, and player means (13) for playing said audio message: characterised in that the transmitter (2a, 2b) and receiver (11) are operative to transmit and receive said packets over a speech channel whilst a call is in progress.

2. A voice messaging system according to claim 1, wherein the transmitter (2a, 2b) is arranged to transmit the data packets as out-of-band data signals in a voice channel currently in use.

3. A voice messaging system according to claim 1 or 2, wherein the transmitter (2a, 2b) comprises means for detecting the presence or absence of voice signals on the channel, and means for transmitting the data packets over the voice channel when no voice signal is present.

4. A voice messaging system according to claim 1, 2, or 3, wherein the memory (14) stores the messages in the terminal equipment in their data packet form, and the decoder (15) is arranged to assemble the messages for generation into a conventional audio form as required by the user.

5. A voice messaging system according to claim 4, wherein the memory includes means for compressing the messages stored in the memory (14) by the removal of parts of the data message received by the terminal (1) which are not necessary for the accurate reproduction of the original sound.

6. A voice messaging system according to claim 5, wherein the memory includes means for the removal of error correction bits and other data overhead required for accurate transmission over the interface between the terminal and the rest of the network.

7. A telephone messaging system terminal equipment (1) comprising: a receiver (11) for receiving data packets forming an audio message, a memory (14) for storing said data packets, a decoder (15) for assembling said data packets into an audio message, and player means (13) for playing said audio message:

characterised in that the receiver (11) is operative to receive said packets over a speech channel whilst a call is in progress.

8. A terminal equipment according to claim 7, wherein the receiver (11) comprises means for receiving the data packets as out-of-band data signals in a voice channel currently in use.

9. A terminal equipment according to claim 7 or 8, wherein the memory (14) includes means for storing the messages in their data packet form, and the decoder (15) is arranged to assemble the messages for generation into a conventional audio form as required by the user.

10. A terminal equipment according to claim 9, wherein the memory (14) includes means for compressing the messages stored in the memory by the removal of parts of the data message received by the terminal which are not necessary for the accurate reproduction of the original sound.

11. A terminal equipment according to claim 10, wherein the memory (14) includes means for the removal of error correction bits and other data overhead required for accurate transmission over the interface between the terminal and the rest of the network.

12. A voice mail system network installation comprising: a means (6) of receiving and storing audio messages, a packetiser (7) for converting said audio messages into data packets, and a transmitter (2a, 2b) for transmitting said data packets to a predetermined terminal (1):
characterised in that the transmitter (2a, 2b) is operative to transmit said packets over a speech channel whilst a call is in progress.

13 A voice mail system installation according to claim 12, wherein the transmitter (2a, 2b) comprises means for transmitting the data packets as out-of-band data signals in a voice channel currently in use.

14. A voice mail system installation according to claim 12 or 13, wherein the transmitter (2a, 2b) comprises means for detecting the presence or absence of a voice signal on the channel, and means for transmitting the data packets over the voice channel when no voice signal is present.

15. A method of storing audio messages in a telephone system for subsequent retrieval, wherein the message is converted into a series of data packets for transmission to a predetermined terminal equipment, for retrieval by the user on demand:
characterised in that the transmitter said packets are transmitted over a speech channel whilst a call is in progress.

16. A method according to claim 15, in which the data packets are transmitted as out-of-band data signals in a voice channel currently in use.

17. A method according to claim 15 or 16, in which the data packets are transmitted over the voice channel when no voice signal is present.

18. A method according to claim 15, 16, or 17, in which the messages are stored in the terminal equipment (1) in their data packet form, and assembled for generation into a conventional audio form as required by the user.

19. A method according to claim 18, in which the messages stored in the terminal equipment (1) are compressed by the removal of parts of the data message received by the terminal (1) which are not necessary for the accurate reproduction of the original sound.

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20. A method according to claim 19, including the removal in the terminal (1) of error correction bits and other data overhead required for accurate transmission over the interface between the terminal and the rest of the network.

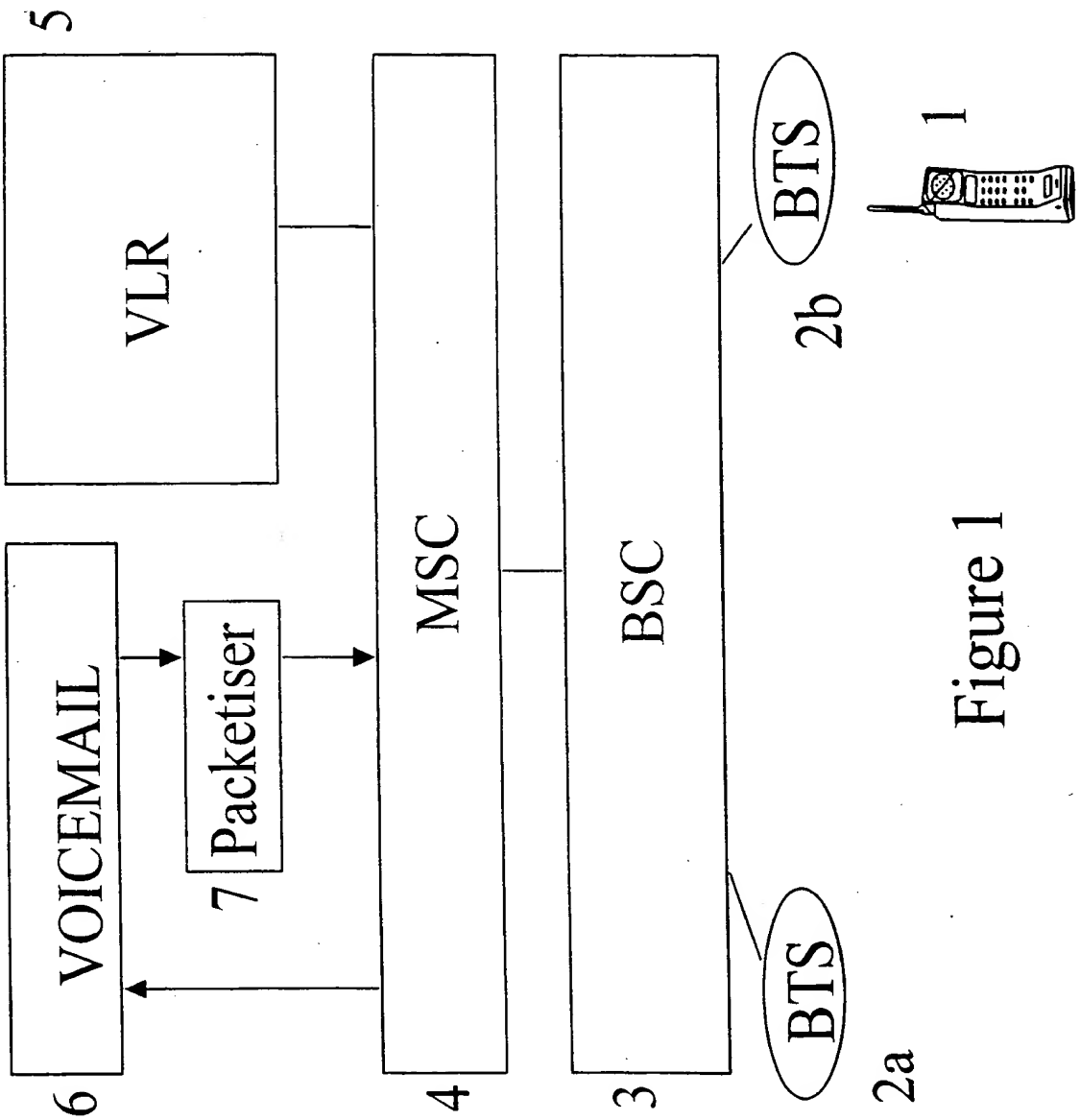

Figure 1

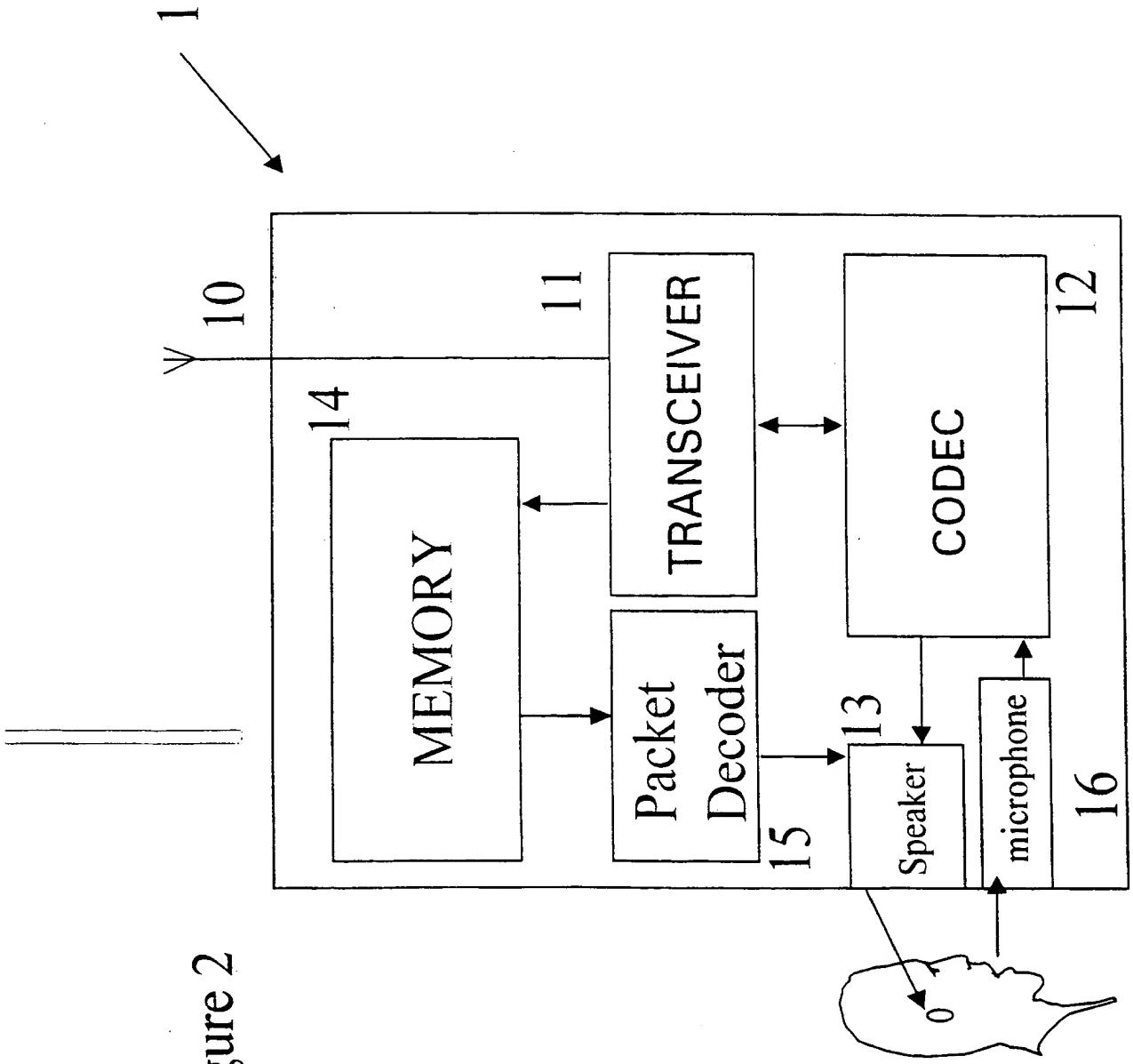
1
10
11
TRANSCEIVER
12
CODEC
14
MEMORY
Packet
Decoder
15
13
Speaker
microphone
16

Figure 2

INTERNATIONAL SEARCH REPORT

rnational Application No
PCT/GB 99/01836

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M3/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 530 740 A (IRRIBARREN ROBERTO ET AL) 25 June 1996 (1996-06-25) figures 3A,4,6,7,9,10 figure 14 column 5, line 29 -column 10, line 40 column 12, line 11 - line 27 ---	1,4-7,9, 12,15, 18,19
A	EP 0 689 335 A (AT & T CORP) 27 December 1995 (1995-12-27) figures 1,2,9 column 2, line 36 -column 6, line 9 column 14, line 2 -column 15, line 16 --- -/--	1,3,7,9, 12,15, 17-19

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 729 258 A (AT & T CORP) 28 August 1996 (1996-08-28) figure 1 page 2, line 43 - line 53	1,2,7,8, 12,13, 15,16

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Information on patent family members

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